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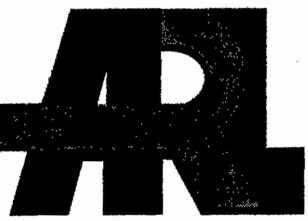

Trade Study: A Two- Versus Three-Soldier Crew for the Mounted Combat System (MCS) and Other Future Combat System Platforms

Diane K. Mitchell, Charneta L. Samms, Thomas Henthorn, and Josephine Q. Wojciechowski

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14. ABSTRACT

Crew size has become a critical issue in military vehicle design. Motivated by the needs of organizations such as the Army Materiel Systems Analysis Activity and the Future Combat System (FCS) lead system integrator, Boeing-Science Applications International Corporation, the U.S. Army Research Laboratory (ARL) decided to take the initiative to investigate this issue. The focus of this trade study was to determine the viability of transitioning to a two-soldier crew for the line-of-sight (LOS) and beyond-line-of-sight (BLOS) platforms in the early FCS force designs for Increment 1. The LOS-BLOS platform is now called the mounted combat system (MCS).

The two- versus three-soldier crew analysis was conducted with task-network models built with the computer simulation tool, Improved Performance Research Integration Tool (IMPRINT). IMPRINT was developed by ARL to evaluate possible system performance by calculating the mental workload associated with each operator to complete a specified mission. Within this trade study, these missions were simulated with networks of functions and tasks representative of possible missions that would be performed by FCS MCS crew members. This study focused on the LOS engagement portion of the MCS mission.

The initial IMPRINT models were developed from existing IMPRINT models of other combat platforms. While the MCS platform should have greater capabilities than its predecessor, the functions of driving, shooting, and communicating are fundamentally the same. FCS concepts seek to equip the MCS crew with technology to enhance their mission performance. These initial models were to be the baseline concept, and the desire was to add technology to the models as applicable. Unfortunately, technology that could affect operator workload such as the ability to off-load driving during dynamic combat operations were not mature enough to allow for accurate model depiction and will not likely be available for FCS Increment 1. Therefore, this functionality was not included in models.
Results of the modeling efforts show that a two-soldier crew for the MCS platform would create a high risk of not meeting necessary system performance requirements. For vehicles whose primary mission is not a combat mission, such as the command and control vehicle, reconnaissance and search vehicle, non-line of sight cannon or mortar, and infantry carrier vehicle, the two-soldier crew may be a lower risk. The results of this study were influential in changing the FCS MCS crew member requirement from two to three in the operational requirements document (25 Nov 2002). This change is also reflected in the operational and organizational plan (25 Nov 2002).

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1. Introduction

The Future Combat System (FCS) is an essential component of the Army's Objective Force. It is the next generation, multi-mission, land combat system. To meet the goals of the Objective Force vision, FCS must be responsive, deployable, agile, versatile, lethal, survivable, and sustainable (Unit of Action Maneuver Battle Lab, 2003). These characteristics, in turn, suggest smaller, lighter weight vehicles. The change in vehicle design has led system designers to propose a reduction in FCS crew size. Crew size is a critical issue for FCS systems, specifically the mounted combat system (MCS) platform, because of the deployability constraints of using the C-130 aircraft (Unit of Action Maneuver Battle Lab, 2002). With space and weight at a premium, minimizing crew size without sacrificing operational capability is critical to stay within the C-130 dimension constraints.

It is also important to acknowledge that FCS will require crew members to be very responsive and to perform multiple mission functions. If the crew workload exceeds their capability to perform their assigned tasks, performance of the FCS may decline and the requirements of the Army's Objective Force vision may not be met. Therefore, system analysts must determine the optimum number of crew members, the best allocation of tasks among those crew members, and how technology can assist those crew members in their mission.

The MCS mission profile shows that the MCS crew could expect, on average, 15 line of sight (LOS) engagements and 31 beyond line of sight (BLOS) engagements during a 72-hour high intensity conflict scenario (Unit of Action Maneuver Battle Lab, 2003). If the BLOS capability is unavailable for Increment 1, then LOS missions could increase. Also, if the enemy can develop tactics, techniques, and procedures to mask their forces from U.S. sensors, dismounted enemy "hunter-killer" teams are proliferated on the battlefield or if the network is not working, limiting the common operational picture (COP), then LOS engagements for FCS MCS platforms could increase. Therefore, this study focused on the crew size and operator workload of the LOS engagement, which could be considered one of the most dangerous FCS missions.

Workload issues associated with two- versus three-soldier crew designs have been investigated in the past. In 1989, Technology International, Inc., conducted a study of a two-crew design in which one crew member (the commander) would control multiple robotic combat vehicles while the other crew member was the vehicle driver (Sabri et al., 1989). The authors concluded that the commander's workload would need to be reduced. To accomplish this reduction, it was recommended that some of the commander's tasks should be reallocated to the driver. The Tank-Automotive Command (TACOM) sponsored this study.

TACOM conducted another study that addressed the issue of the commander's workload in a two- versus three-member crew. This study, conducted by Micro Analysis & Design, Inc. in

1997, examined the interaction between crew performance and the application of advanced technologies (Smart, Rapkoch, Dahill, Fritz, and Williams, 1997). The researchers collected data from crew exercises in a baseline M1A2 main battle tank simulator and an advanced technology combat vehicle (ATCV) simulator. The ATCV was designed for a crew of two with the driving tasks and command and control (C2) tasks assigned to the vehicle commander. The targeting, gunnery, weapon management, and countermeasure functions were assigned to the gunner. The performance and mental workload ratings of the ATCV crew were then compared to the performance and mental workload ratings of the baseline M1A2 crew. The results from these exercises were inconclusive. Although the authors concluded that the crew size could be reduced without loss of combat efficiency, they did not have measures that would make it possible to conclude that the ATCV crew station's capability to perform C2 functions was equal to or better than the baseline. The results of the subjective workload measures that were collected were significantly poorer for the ATCV crews than the baseline crews.

These workload discrepancies were also predicted by computer models built by the U.S. Army Research Laboratory's (ARL's) Human Research and Engineering Directorate in support of the crew integration and automation test bed (CAT) advanced technology demonstrator (ATD). To support the CAT ATD program, ARL researchers built three baseline models of current size crews conducting scout, combat, and carrying missions. The combat model was then modified to reflect two crew members operating in the CAT ATD simulator. The baseline and two-crew-member models were task-network computer models built with IMPRINT. For the two-soldier combat model, it was assumed that the commander would also be the vehicle driver. The mental workload profiles produced by the models indicated that the commander-driver had high workload peaks a number of times during the mission. Operators tend to make performance errors when workload peaks beyond their capability to cope with it; therefore, it can be concluded that the commander-driver may make errors at these points in the mission. Specifically, the commander's workload became excessive when multiple tasks were being performed such as driving and communicating. Because of the outcome of the CAT ATD modeling effort, ARL researchers decided to build models to determine the function allocation that would result in a more manageable, evenly distributed workload for a two-soldier crew design. This trade study report documents this modeling effort.

2. Objective

The objective of this trade study was to examine the mental workload of the FCS MCS crew to determine the best allocation of the combat functions among two- and three-soldier crews.

3. Trade Methodology (Models and Simulations)

The ARL Improved Performance Research Integration Tool (IMPRINT) is a stochastic network-modeling tool designed to help assess the interaction of soldier and system performance from concept and design through field testing and system upgrades. An important feature of IMPRINT is that it helps researchers and designers evaluate operator and crew mental workload while testing alternate system-crew function allocations. The amount of mental workload that is required to use a system has a significant effect on human performance within the system. IMPRINT gives system designers the information they need to predict how changes in design can affect overall system performance. Since FCS is in the conceptual phase, IMPRINT was the ideal tool to use in order to perform this trade study.

3.1 Mental Workload and Performance

The relationship between workload and performance is complicated. Often, it is assumed that as workload increases, performance decreases. In actuality, the relationship between workload and performance can be best described as an inverted "U" because decrements in performance may occur if workload is either too low or too high (Nachreiner, 1995).

Furthermore, there can be a disassociation between workload and performance at certain levels. This means that as workload increases, the operator's performance may not decrease because the operator has a strategy for handling task demands to compensate for the increased workload. Hart (1989) proposed that operator workload strategies play an important role "in determining the relationship between objective task demands, experienced workload, and system performance (p. 4)." By using two types of mental workload (visual, auditory, cognitive, and psychomotor [VACP] and advanced), IMPRINT allows system analysts to look at each of these situations.

3.1.1 VACP Workload

In the VACP workload option of IMPRINT, mental workload is divided into four resources: visual, auditory, cognitive, and psychomotor. The amount of each of these resources necessary to perform a task is estimated via 7-point scales developed by McCracken and Aldrich (1984). IMPRINT calculated a workload number for each task by summing across all four resources for that task. Each time a task begins or ends, IMPRINT calculates an overall workload value for that time by summing across the totals for all tasks occurring. Any time a workload value exceeds 7 for visual, auditory, cognitive, or psychomotor, the person is considered to have exceeded his or her workload capacity for that particular resource (McCracken and Aldrich, 1984). In addition, some researchers believe that when the overall workload value (V+A+C+P) exceeds 40, a person is considered to have exceeded his or her overall workload capacity (Reid and Colle, 1988). This method of calculating overall workload is most effective when one is comparing different variations of a particular model.

3.1.2 Advanced Workload

The advanced workload analysis feature of IMPRINT allows the system analyst to incorporate operator workload management strategies into the workload model. The advanced workload algorithm calculates workload based on the resources being used by the operator and incorporates the fact that multiple tasks are being performed simultaneously (Little et al., 1993).

Within the advanced workload option, mental workload is divided into five resources: visual, auditory, cognitive, psychomotor, and speech. Although these five resources are the default within IMPRINT, it is also possible to create and add new resources if desired. When using the default resources, analysts rate the amount of each of these resources required to do a task on 7-point rating scales. These scales are modified versions of the scales used in VACP (Little et al., 1993). The system analyst uses these scales to estimate the resources required for each task that an operator performs. Once the workload values have been entered, the workload algorithm embedded in IMPRINT calculates the mental workload. The calculation method in this algorithm is based on the Multiple Resource Theory (MRT) (Wickens, 1991).

According to MRT, when an individual performs a task, he or she requires different mental operations and to some extent, each operation uses the mental processing resources necessary to accomplish the task. These mental resources are limited, and a supply-and-demand problem occurs when the individual performs two or more tasks that require a single resource. As a result of time sharing of resources, some task performance times may increase, the probability of successfully completing a task may change, or performance times may decrease (Little et al., 1993). These MRT concepts are the underlying assumptions for the advanced workload option in IMPRINT. The analyst runs the advanced model and determines where the workload peaks are and which tasks were operating at that time and contributed to the peaks. These tasks can then be identified as candidates for redesign, automation, or reallocation to another crew member (Archer, 1998).

For the purpose of this trade study, when the overall workload value exceeded 60 for the advanced model, the operator was considered to be in a state of high workload. The workload value of 60 was determined by consensus of subject matter experts (SMEs) familiar with the MCS concept.

3.1.3 VACP Workload Models

The models are comprised of a primary mission with several underlying functions (see Table 1). Each underlying function, in turn, is reduced to a number of tasks. The primary mission is to drive from a starting point to the area of engagement. In order to determine an optimum crew size and function allocation for the FCS MCS vehicle, several variations of FCS crews performing combat missions were modeled in IMPRINT via VACP workload.

As the vehicle moves from one location to another, the driver needs to avoid hindrances, such as obstacles or threats. The driver must also correct problems that occur with the vehicle such as

mechanical failures or damage to the vehicle from threats. Driving is a continuous function that occurs throughout the mission, including when the crew members are engaging targets. Scanning for targets and communicating within and between vehicles are also continuous functions that occur throughout the mission. Targets are engaged, vehicle problems are corrected, and hindrances are avoided intermittently throughout the model run. The ARL system analysts met with several military SMEs from Aberdeen Proving Ground, Maryland, and Fort Knox, Kentucky, who verified that the tasks in the model adequately represented a conceptual MCS mission.

Table 1. Model structure and functions

Model Structure	Function Name
Primary Mission	Drive
Function 1	Avoid hindrance (probabilistic)
Function 2	Remediation necessary (probabilistic)
Function 3	Engage targets (probabilistic)
Function 4	Scan for targets (ongoing)
Function 5	External communications (ongoing)
Function 6	Crew communications (ongoing)

Table 2 describes four different model conditions. Each condition represents a different function allocation between crew members. Conditions 1 through 3 represent the allocation of functions between two crew members, whereas Condition 4 represents the allocation of functions among three crew members. The possible crew positions are tank commander (C), driver (D), gunner (G), and the combinations of these: commander-driver (CD), gunner-driver (GD), and commander-gunner (CG), as shown in Table 3.

Table 2. Function allocation over all four conditions

Function Labels	Condition 1		Condition 2		Condition 3		Condition 4		
	GD	C	CD	G	CG	D	C	G	D
Drive	YES	NO	YES	NO	NO	YES	NO	NO	YES
Hindrance	YES	NO	YES	NO	NO	YES	NO	NO	YES
Remediate	YES	NO	YES	NO	NO	YES	NO	NO	YES
Engage	YES	YES	YES	YES	YES	NO	YES	YES	NO
Scan	NO	YES	NO	YES	YES	NO	YES	YES	NO
External Commo[a]	NO	YES	YES	NO	YES	NO	YES	NO	NO
Crew Commo	YES	YES	YES	YES	YES	YES	YES	YES	YES

[a]Commo = communications

Table 3. Experimental design matrix for two-soldier crew function allocation

	Commander	Driver	Gunner
Commander	-	CD	CG
Driver	CD*	-	GD
Gunner	CG*	GD*	-

* Similar combinations

In all the modeled conditions, both the commander and gunner are involved in some part of engaging the target. The commander verifies the target, decides whether to engage the target, and sends reports to higher headquarters after the target is destroyed. The gunner chooses the weapon and ammunition, arms and auto-loads the weapon, and then shoots and destroys the target. If the commander or gunner is also the driver, then scanning is only performed in the context of driving. The driver would not scan via the sight or sight extension. The crew member who is not driving scans via the sight. In condition 3, where the commander is also the gunner, the CG performs all the engage target tasks. In all the modeled conditions, the commander always handles the communications with higher headquarters and lateral units and determines how to respond to the messages. All the crew members talk to each other within the vehicle. Also, in all conditions, the driver remedies problems with the vehicle and also avoids hindrances.

3.1.4 Advanced Workload Models

In order to take a closer look at the workload issues of the FCS MCS, one VACP model was converted to four advanced workload models. Since condition 3 was determined to be the best two-soldier crew function allocation, the CG and driver allocation were selected for further study. The basic composition of the models as explained before was not changed during the conversion to advanced workload. In the advanced workload study, two new conditions were created to look at issues suggested in the previous study: (a) the addition of an automated scanning system and (b) a non-combat FCS platform. Table 4 lists the advanced models that were developed.

Table 4. Advanced workload study conditions

Condition	Model Concept
1	Combat Scenario
2	Automated Scanning Scenario
3	Combat Scenario with No Engagements (baseline)
4	Non-combat scenario

3.1.5 Model Execution

Since mental workload of the crew was the focus of this trade study (not time and accuracy), each VACP and advanced workload model was executed one time. In order to ensure that each model ran on a similar path, a common random number seed was determined. The path that was selected allowed each model to complete the combinations of tasks that provided a reasonable picture of mental workload required by the crew to complete its mission. This method provides a measure of workload that is indicative of the average overall workload. The results of the advanced workload models were based on one run, but each model was run ten times to ensure that the average workload that would be experienced by the crew was reflected.

4. Results

4.1 VACP Workload Analysis of Optimum Crew Size

4.1.1 Condition 4: Commander, Gunner, and Driver

Condition 4 was the only condition that represents three crew members performing the combat mission (see Table 5). The only crew member whose workload capacity is exceeded in this condition is the driver. There were 28 instances when the driver's overall workload exceeded the workload threshold of 40 (see Table 5).

Table 5. VACP workload for condition 4

Resources	Max Value			Instances in Overload (No. of times >7)		
	D	C	G	D	C	G
Visual	23	7	7	199	0	0
Auditory	11	1	5	5	0	0
Cognitive	24	17	14	173	16	7
Psychomotor	6	15	9	0	16	5
Overall Workload	Max Value (V+A+C+P)			Instances in Overload (No. of times >40)		
	D	C	G	D	C	G
	56	34	33	28	0	0

Additionally, there were 199 instances when the driver's visual workload exceeded the threshold of 7 and another 173 instances when the driver's cognitive resource exceeded 7 (see Table 6). This high workload represents the complexity of the drive function itself. The driver must perform the motions of driving (accelerate, steer, or brake) while visualizing the route and

maintaining awareness of the vehicle's status. The driver must also avoid obstacles and correct problems with the vehicle. Because the driver's workload is already excessive, combining any other tasks with driving increases the probability of mistakes. The high level of workload associated with driving can also increase the possibly of mistakes occurring while driving is the only function being performed (National Highway Transportation Safety Administration, 1997). Condition 4 is also the only condition in which two crew members are scanning for targets. Because two crew members are scanning for targets, it can be assumed the probability that a target is detected would be increased. In addition, having two crew members scanning permits the "hunter-killer" technique to be used. With this technique, the gunner can actively engage a target while the commander scans for the next one. This technique also increases the chance of target detection and therefore, survival of the crew. This is also the only condition in which there is a secondary operator available if one of the crew members becomes incapacitated by fatigue or injury. As shown in Table 5, the gunner and commander are rarely overloaded. Considering the lower workload profiles and increased survivability of the crew, condition 4 is the best of all the modeled function allocations. In contrast, the worst was condition 2, commander-driver and gunner.

4.1.2 Condition 2: Commander-Driver and Gunner

As shown in Table 5, condition 2 requires the commander to assume a larger portion of the system functions. The CD role combines the high workload resulting from the tasks demands of the driving function with the additional workload of commanding the vehicle and participating in target engagements. This combination resulted in the highest workload of any of the four conditions modeled. As seen in Table 6, a maximum overall workload value of 86 was recorded. There were 61 instances when the CD's workload exceeded a threshold of 60, whereas none of the other conditions ever exceeded 60. Furthermore, there were an additional 225 instances when the CD workload exceeded the threshold of 40 (see Table 6). There were more than 200 instances when the workload threshold of 7 was exceeded for each of the visual, cognitive, and psychomotor resources of the CD. The gunner's workload, on the other hand, never exceeded the overall threshold of 40 and rarely exceeded 7 for any of the individual resources. Because the gunner's workload was lower than the commander's in the three-crew model, it was expected that condition 1 with a gunner-driver would result in less workload than the CD condition.

Table 6. VACP workload for condition 2

Resources	Max Value		Instances in Overload (No. times >7)	
	CD	G	CD	G
Visual	35	7	293	0
Auditory	12	5	12	0
Cognitive	31	9	296	2
Psychomotor	14	9	229	5
Overall Workload	Max Value (V+A+C+P)		Instances in Overload (No. times >40)	
	CD	G	CD	G
	86	23	225	0
			(No. times >60)	
			61	0

4.1.3 Condition 1: Commander, Gunner-Driver

As shown in Table 2, condition 1 represents the GD being responsible for all driving and engagement functions whereas the commander is responsible scanning and external communication while overseeing the gunner's engagements. In this condition, the GD's workload never exceeds 60 (see Table 7). There are 42 instances when the GD's workload exceeds the workload threshold of 40. However, this is much less than the 225 instances over 40 in condition 2 with the CD. Furthermore, this number of instances is not many more instances than the 28 experienced by the crew member acting only as the driver in condition 4 with three crew members. The difficulty with this function allocation lies not with the workload levels but with real-world practicality. If the gunner is also acting as driver, then he must stop driving while actively engaging a target since the controls preclude him from doing both tasks at once. This eliminates any engagements while he is moving, which violates the FCS concept. Since this condition seems impractical for the FCS concept, condition 3 driver and CG, was modeled.

Table 7. VACP workload values for condition 1

Resources	Max Value		Instances in Overload (No. times >7)	
	GD	C	GD	C
Visual	25	13	256	11
Auditory	16	1	13	0
Cognitive	25	16	232	16
Psychomotor	6	16	0	17
Overall Workload	Max Value (V+A+C+P)		Instances in Overload (No. times >40)	
	GD	C	GD	C
	60	39	42	0

4.1.4 Condition 3: Commander-Gunner and Driver

In condition 3, the driver's workload results are similar to the results in the three-crew-member function allocation condition. The CG's overall workload, however, never exceeds the workload threshold value of 40 (see Table 8). The CG also had few instances when the workload of the individual resources exceeds 7. Therefore, this is the preferred two-crew member function allocation. Note, however, that this was a model of a CG commanding a single tank. If the CG were the lead platoon commander, the additional task demands of commanding a platoon would be expected to greatly increase mental workload and therefore most likely exceed acceptable levels. Furthermore, a two-crew-member design does not allow for substitution if a crew member is incapacitated or resting during modes of continuous operation.

Table 8. VACP workload values for condition 3

Resources	Max Value		Instances in Overload (No. times >7)	
	D	CG	D	CG
Visual	24	13	250	15
Auditory	16	1	13	0
Cognitive	25	16	229	20
Psychomotor	6	16	0	21
Overall Workload	Max Value (V+A+C+P)		Instances in Overload (No. times >40)	
	D	CG	D	CG
	60	39	41	0

4.1.5 Discussion of VACP Workload Analysis

In all the modeled conditions, the visual and cognitive mental resources thresholds were exceeded most often. Therefore, converting some of the tasks from visually demanding tasks to auditory tasks might help reduce the crew members' workload. Also, automatic target recognition (ATR) might help increase the probability of survival of the crews. However, it could also increase the commander's visual and cognitive workload because the commander would still be required to confirm targets. In situations when the ATR system is not precise (i.e., creates many false alarm targets), this automation would become a nuisance and could actually increase the commander's workload beyond current levels.

The preliminary IMPRINT models indicated that the combat vehicle should commit one crew member as the driver. Furthermore, the driver should not do any tasks other than driving. Research studies conducted by other organizations, such as the National Highway Transportation Safety Administration (NHTSA) and Transport Research Laboratory (TRL) in the United Kingdom support the findings of the ARL models. The NHTSA studies focused on the potential safety implications associated with driver distraction while using advanced within-vehicle technologies such as a cell phone or navigation systems. These studies indicate that when a driver performs any additional visual or manual tasks along with driving, such as engaging in a cell phone conversation, his or her performance suffers and the risk of accidents increases (National Highway Transportation Safety Administration, 1997). Specifically, the TRL study (Direct Line Insurance, 2002) concluded that reaction times for drivers were an average of 30% slower when the driver was engaged in a cell phone conversation while driving than when the driver was legally over the limit for alcohol consumption and driving. Furthermore, the reaction times for drivers talking on a mobile phone were 50% slower than when they were driving without one. These findings suggest that distractions are detrimental to driving performance and support recommendations for a separate driver in a two-soldier crew design.

If one crew member in a two-soldier crew design is functioning as a driver, then the other crew member must perform all the commanding and gunning functions. The two- versus three-soldier issue then becomes an issue of whether the other crew member can perform these functions successfully and concurrently. Therefore, to further investigate this issue, ARL modelers built an advanced workload IMPRINT model of the CG and driver two-soldier crew design.

4.2 Advanced Workload Analysis of the Commander-Gunner's Role

Preliminary runs of the advanced workload model of the MCS two-crew member design indicated that the CG experiences high workload whenever he needs to scan for targets and also be aware of his unit's position on a map. If the MCS vehicle is equipped with automated target scanning, the CG workload may be alleviated because the need to scan for targets will be eliminated. However, with automated target recognition systems, the commander will still be required to identify and then confirm or deny targets detected by the automated system. If the automated system requires the commander's intervention too many times, this need to intervene

may actually increase rather than decrease the CG's mental workload. Therefore, future modeling efforts should look at the commander's ability to effectively perform the identification task while he is performing other tasks. Similarly, the CG's mental workload peaked when he was required to communicate with headquarters while maintaining awareness of the unit and scanning for potential threats.

Table 9 summarizes the workload of the CG from four advanced workload models that represent four different vehicle scenarios: combat, automated scanning, combat with no engagements, and non-combat. The model runs for a total of 600 seconds (10 minutes). Although 10 minutes may seem a short period of time, in the military arena, success or failure in engagements can be measured in seconds and fractions of seconds.

Table 9. Results of four advanced workload models

	Combat	AutoScan	No Engage	Non-Combat
Number of Times over 60	112	91	97	50
Percent of time in overload > 60	46.9%	37.7%	39.8%	34.2%
Max Workload Value	244.18	287.02	283.9	245.82
Number of Times over 100	69	44	59	29
Percent of time in overload > 100	28.3%	19.1%	24.0%	23.5%

4.2.1 Condition 1: Combat Scenario

In the dynamic combat environment modeled here, the CG experiences high workload (>60) 112 times over almost half of the scenario run. Also, the CG has 46 instances of very high workload (>100) that occur over 28% of the scenario. The workload as a function of time is graphed in Figure 1.

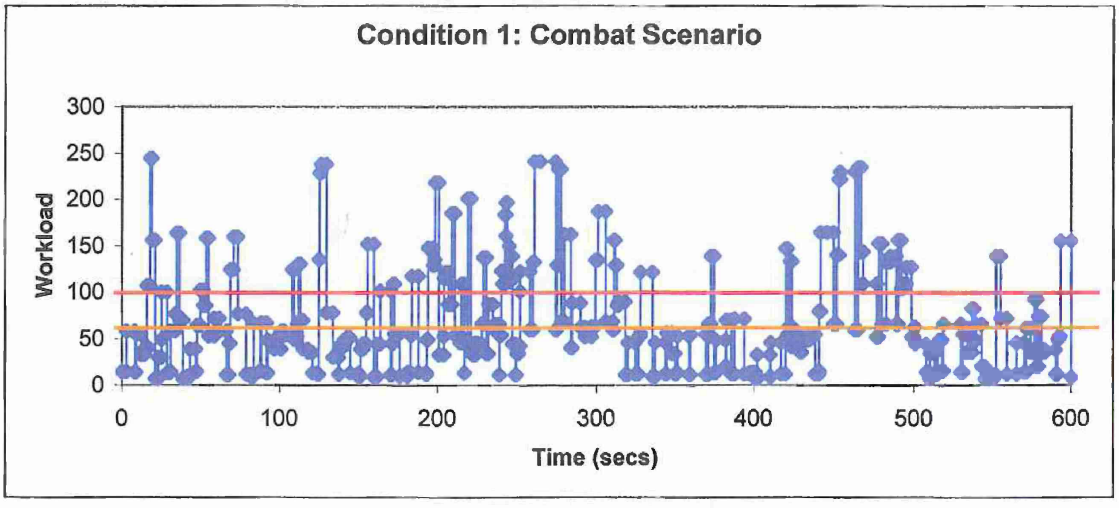

Figure 1. Workload-over-time graph of the combat scenario.

While lethality and survivability cannot be specifically derived from this model, task success and failure can be predicted. As noted in previous discussion, instances of high workload would likely cause a task to fail. Task failures significantly decrease soldier performance. With this in mind, a look at the portion of the model from 225 to 270 seconds highlights the type of tasks that the CG is required to perform and the potential conflicts between multiple tasks occurring simultaneously (see Figure 2). The enemy vehicle appears at second 242 (Figure 2). The graph shows the task conflict in the seconds leading to the initiation of the engagement. In the 4 seconds just before the target appears, the CG is managing four separate tasks (see Table 10). From 232 seconds to 237 seconds, the CG is attempting to scan for targets and manage the COP. Both tasks have visual components that are in direct conflict. The CG must prioritize these tasks and ignore, degrade, or delay the lower priority task. Management of these tasks does not include those tasks that may be delayed and "pushed" (i.e., scanning or maintaining COP) into this time frame. The soldier is experiencing very high workload at this point. The "in vehicle communications," "looking at the COP," and beginning to "send a digital message" (even a simple one) are likely prioritized at this point (second 242). When these tasks conflict with the scanning task, then the soldier may lose precious seconds beginning (and finishing) the engagement sequence.

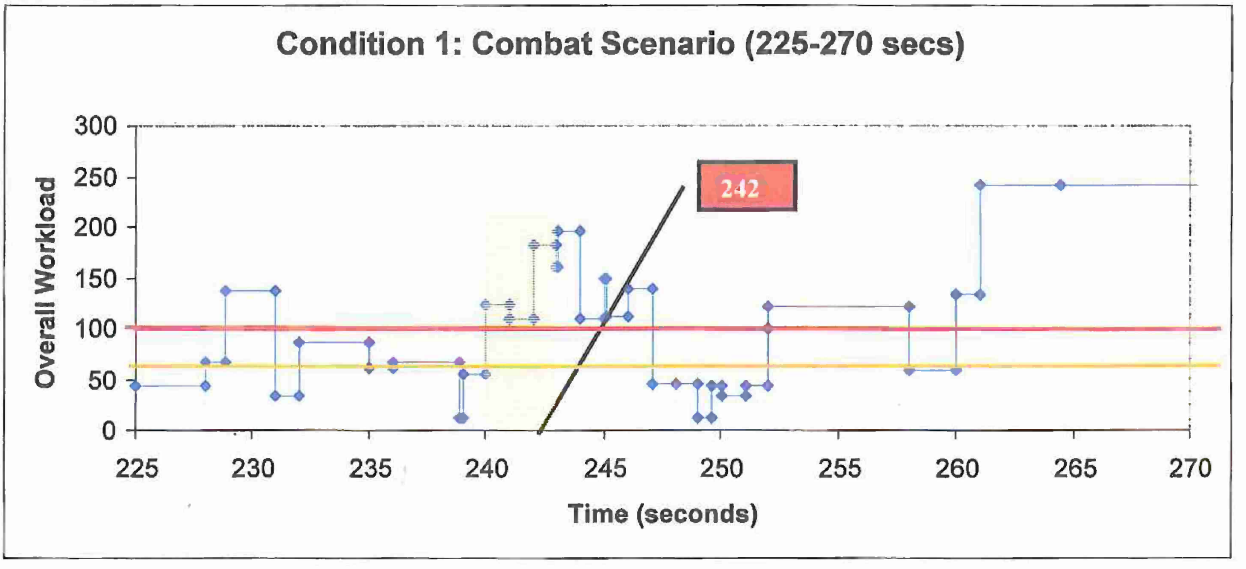

Figure 2. Enlargement of the workload-over-time graph of the combat scenario for time 225 to 270 seconds.

Table 10. Function, task, times, and action list before engagement

Function Name	Task Name	Beginning Time	Ending Time	Actual Task Description
Crew communication in vehicle	CG hears D message via intercom	238.84	244.67	Driver: Sgt Smith, PL confirms location south of checkpoint BRAVO
CG Scan	monitor + update C4 display	239.00	241.00	CG scans for enemy targets/obstacles
Maintain awareness of	CG looks at enemy location on map	240.00	244.00	CG : Looks at COP to confirm location south of checkpoint BRAVO
Communication with HQ	Send Digital Message CG	241.00	244.00	CG: Clicks "confirms location" in digital message to PL

One option would be to ensure that "scanning is always the priority". Since scanning is generally deemed a continuous function that would preclude the CG from accomplishing other tasks because of functions such as crew communication, communication with headquarters and management of the COP (the essential information dominance element of FCS) would always be ignored or delayed. This leads to the question of whether automated scanning could reduce soldier workload—an option that was explored in condition 2.

4.2.2 Condition 2: Automated Scanning

In this condition, scanning was reduced to an automatic function, meaning that the CG or any other crew member would have NO scanning responsibility for the platform. Scanning is automatic and continuous for the vehicle. There are two problems with this premise. First, as has been stated elsewhere, automated scanning does not exist today. However, for the sake of analysis, this capability is presumed. Second, even if scanning were automated, the crew member would still have to interact with the automated scanner. Whether it is strictly a monitoring function or waiting for a "target identified" signal, there will be some interaction with the system (unless it was automatic AND autonomous). Because the interactions required with these technologies and projected modalities (VCAP) are unknown, the model was developed and executed by the elimination of the scanning workload contributions.

The chart in Figure 3 represents the first 240 seconds in combat and the automated scanning scenarios. In the combat scenario, once the engagement started, the scanning function was stopped to represent the CG dropping the scanning task in order to fulfill engagement tasks. Since scanning is dropped during an engagement in the combat model and completely eliminated in the automated scanning model, the only workload results that would be different are the times before engagement. Since the engagement takes place at the 242nd second, the first 240 seconds are valuable for analysis.

Table 11 shows the workload results for both models. By the introduction of the automated scanning function, a drop in workload can be noted. The number of instances of high workload for the CG (>60) is reduced from 46 to 26. The percentage of time in overload dropped approximately 30% (from 40 seconds in overload down to 28 seconds). Even larger drops were

expected in the very high workload region (>100). The number of instances in high workload dropped from 28 to 6. In this scenario, the CG only spent approximately 7 seconds of the first 4 minutes (240 seconds) with very high workload compared to 23 seconds in the combat scenario.

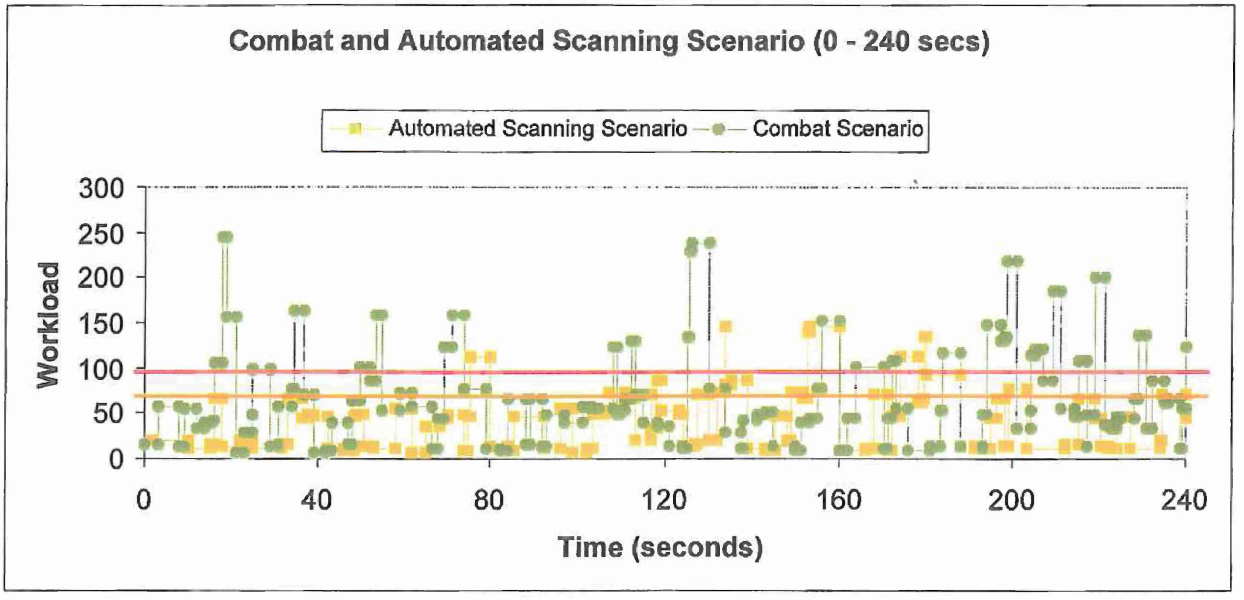

Figure 3. Workload-over-time graph of the combat and automated scanning scenarios (0 to 240 secs).

Table 11. Results of combat and automated scanning scenarios*

	Combat	AutoScan	Baseline	Non-Combat
Number of Times over 60	46	26	46	19
Percent of time in overload >60	16.7%	11.8%	16.7%	14.2%
Maximum Workload Value	244.18	146.11	244.18	245.82
Number of Times over 100	28	6	28	15
Percent of time in overload >100	9.6%	2.8%	9.6%	12.3%

*represents time 0 to 240 seconds

4.2.3 Condition 3: Combat Run, No Engagements

This "baseline" condition, Table 9 and Figure 4, examines the workload reduction if engagements are not part of the scenario. Fundamentally, without engagements, the consequence of task failure may be significantly less because the failure to effectively scan or manage other system functions would not result in a missed target and thus, vehicle casualties. However, soldiers may spend significant time in a high risk environment where contact is possible or even expected, and the task loading in those situations may be representative of the combat environment when the actual shooting function is not executed.

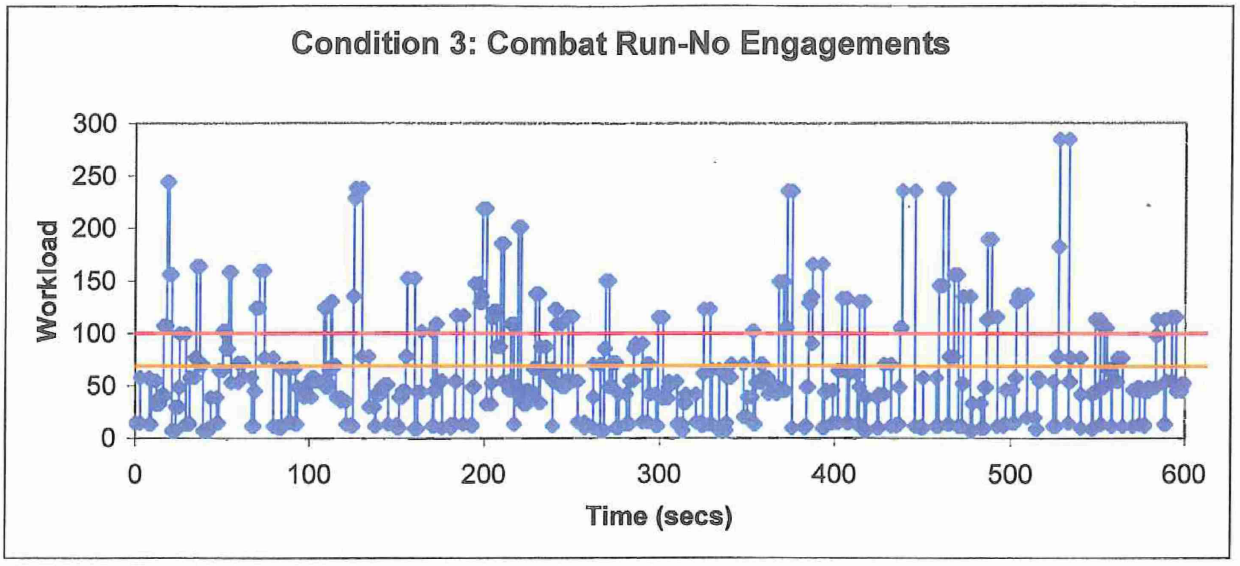

Figure 4. Workload-over-time graph of combat scenario with no engagements.

In this scenario, the CG's high workload instances (>60) and the total time in high workload both decrease. Both measures drop about 13% to 15% from the combat scenario. Note: Table 9 shows a peak workload value for the "autoscan" run at 287 and in the baseline run at 284, versus a peak value for the more complex (more tasks with the engagement function) combat environment, which had a peak value of 244. This occurs because of the random nature by which the frequencies and durations of recurring tasks are accomplished by the model. Occasionally, multiple conflicting tasks may coincide to create very high workload, even if the task network layout is simpler than another run.

4.2.4 Condition 4: Non-combat Model

The "non-combat" model is similar to the "baseline" model in condition 3. However, the premise of many of the "non-combat" vehicles in FCS (i.e., those vehicles such as the infantry carrier vehicle [ICV], the command and control vehicle [C2V] and the medical variations [MEV]) is that they intentionally (based on the information network) stay OUT of the most likely and most dangerous dynamic combat environments. That does not mean that operators can shed tasks such as scanning, but the frequencies of some tasks may be reduced while the durations of others, such as external vehicle communication, may increase slightly without associated combat pressure. The results of this run are shown in Figure 5.

Table 12 shows the changes made between the combat and non-combat runs for the major function in both frequency and duration. These values have been based on professional judgment since there is no fidelity in current force-on-force modeling efforts for this level of individual soldier performance.

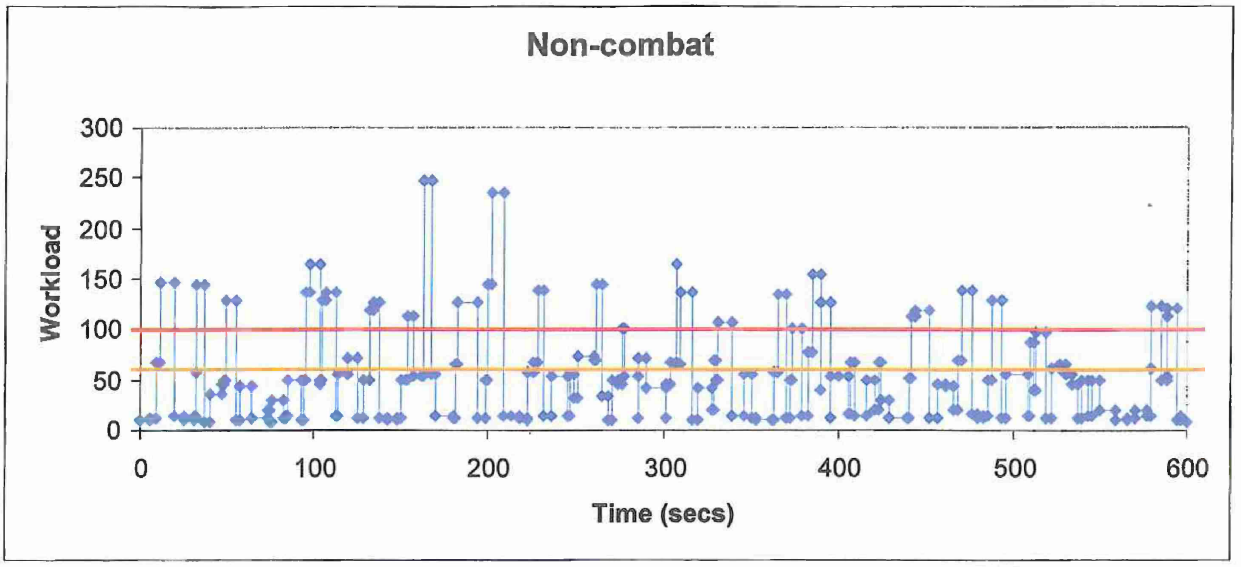

Figure 5. Workload-over-time graph of non-combat scenario.

Table 12. Model variable values for combat and non-combat scenario

Functions	Combat Scenario		Non-Combat Scenario	
	Frequency	Duration	Frequency	Duration
Maintain Awareness	1 to 20 secs	1 to 5 secs	5 to 30 secs	1 to 10 secs
Scan for Targets	1 to 10 secs	2 to 5 secs	1 to 20 secs	2 to 5 secs
Communications, external	1 to 10 secs	2 to 4 secs	1 to 20 secs	2 to 5 secs
Communications, internal	1 to 10 secs	2 to 4 secs	1 to 15 secs	2 to 5 secs

For the non-combat runs, there was a large decrease in the task loading of the CG. The instances of high workload (>60) drop from 112 to 50 (-55%) and the time spent in overload was approximately 30%. The number of instances in very high workload (>100) drops from 69 to 29 (-58%) while the time spent at above this level drops 17%.

To ensure that the analysis of each important condition was valid, multiple runs were conducted for the combat and non-combat models. Each model was run ten different times in order to force the model down a variety of paths. This procedure shows the variability in workload that is caused by what the operator is actually doing throughout the model. Table 13 shows the runs from the non-combat model while Table 14 shows the combat model data. For the non-combat series, run 9 represents the analyzed combat model. For the combat series, run 6 represents the analyzed combat model.

As shown in Table 15, the average of the multiple runs in comparison to the analyzed run is very close. This confirms that the analyzed model was indicative of general model behavior.

Table 13. Data from multiple runs of the non-combat model

NonCombat Model (10 runs)										
	1	2	3	4	5	6	7	8	9	10
Number of Times over 60	53	51	52	57	47	50	50	45	50	54
Percent of time in overload >60	33.3%	34.0%	30.6%	34.7%	31.9%	33.6%	34.2%	31.1%	34.2%	34.9%
Max Workload Value	248.1	286.14	274.9	230.2	226.41	252.6	237.8	218.2	245.82	282.1
Number of Times over 100	36	23	31	33	24	29	25	26	29	28
Percent of time in overload >100	23.6%	20.5%	18.5%	21.3%	17.2%	21.9%	19.0%	21.0%	23.5%	17.1%

Table 14. Data from multiple runs of the combat model

Combat Model (10 runs)										
	1	2	3	4	5	6	7	8	9	10
Number of Times over 60	126	104	118	95	94	112	112	107	114	111
Percent of time in overload >60	54.7%	50.0%	49.0%	42.9%	44.2%	46.9%	50.8%	46.7%	46.0%	51.3%
Max Workload Value	288.8	288.8	287	291.5	287	244.2	262.3	291.5	287	283.9
Number of Times over 100	72	62	73	61	55	69	69	69	80	66
Percent of time in overload >100	33.0%	29.7%	32.0%	29.4%	27.0%	28.3%	32.1%	31.6%	32.1%	28.8%

Table 15. Comparison of multiple runs with original run

	Combat		Non-Combat	
	Original Run	Average	Original Run	Average
Number of times > 60	112	109	50	51
Percentage of time in overload > 60	47%	48%	34%	33%
Maximum Value	244	281	246	250
Number of times > 100	69	68	29	28
Percentage of time in overload > 100	28%	30%	23%	20%

5. Recommendations

Based on the results of this trade study, options other than a two-soldier crew for the MCS platform should be strongly pursued. In order to make two-soldier crews low risk from a soldier workload perspective for combat platforms, significant automation would be required, which is currently unavailable. While driving and sensor aids may be of value to the operator (reduced workload) during the execution of mundane tasks, neither capability has the technical maturity to enable the crew to disregard these functions (driving and scanning) at the critical point of combat in a scenario.

While these data indicate that a three-soldier crew better distributes the workload associated with the MCS platform to manageable levels, this analysis cannot conclude the effectiveness (lethality and survivability) of the MCS platform with that crew. Based on this workload analysis, for a two-soldier crew, the failure point or critical path for mission accomplishment (in a LOS engagement) will reside in the crew workload. By the addition of a third crew member, the success of the MCS platform will reside in the technical capability associated with the platform, not in management of the crew's workload. When non-combat platforms of the FCS are designed, a two-soldier crew can be considered. However, further analysis of each specific platform and function allocation should be conducted.

These results do not show the impact of task failure on survivability and lethality, but they do establish a clear distinction between various scenarios and identify areas for potential improvement in future design. Also, an analysis of time and accuracy of the mission conditions has not been conducted. More specific FCS information is needed to complete this analysis, with the initial models serving as the basis for this work.

Sustainment and maintenance aspects of the mission were not considered in this analysis. IMPRINT tools can be used to do platform maintenance assessments for manpower requirements as well. However, there is not enough fidelity in the performance parameters of platform sub-systems to obtain relevant results at this time.

While fatigue will certainly have an impact on soldier performance over the 72-hour mission, the time and accuracy data required to conduct this analysis within IMPRINT are not available at this time.

This study is a good starting point for future analysis. The models currently developed will continue to be revised and refined throughout the development process. With a credible baseline model available, crew performance can be evaluated as technologies mature. ARL is also exploring techniques to quantify results, not just in terms of workload but also by examining the consequences of task failure and the impacts of workload and accuracy (performance) data on system (and ideally systems of systems) lethality and survivability. Building a better relationship among high soldier workload, task failure, and the relative impact on survivability and lethality is the focus of continiuing efforts.

5.1 Impact

The results of this study were influential in changing the FCS MCS crew member requirement from two to three in the operational requirements Document (25 Nov 2002). This change is also reflected in the operational and organizational plan (25 Nov 2002).

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Appendix A. Data for Condition 1: Combat Scenario

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
0	14.7	CG Scan	monitor + update C4 display
3	58.01	Commo with HQ	Send Digital Message CG
		CG Scan	monitor + update C4 display
8	13.5	Commo with HQ	Receive Digital Message CG
9	54.6	Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
12	32.11	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
14	38.67	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random 2-5s) CG
15.89	42.09	CG Scan	Scan (random 2-5s) CG
		Crew commo in vehicle	CG talks via intercom
16	106.91	Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random 2-5s) CG
18	244.18	CG Scan	Scan (random 2-5s) CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
19	155.93	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
21	7	Commo with HQ	Assess Situation CG
23	29.66	CG Scan	Scan (random 2-5s) CG
		Commo with HQ	Assess Situation CG
25	48.96	Maintain awareness of enemy, own units	CG looks at enemy location on
		CG Scan	Scan (random 2-5s) CG
25.12	99.93	Maintain awareness of enemy, own units	CG looks at enemy location on
		CG Scan	Scan (random 2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
29	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
31	14.7	CG Scan	monitor + update C4 display
31.06	57.86	Crew commo in vehicle	CG talks via intercom
		CG Scan	monitor + update C4 display
34	76.89	Commo with HQ	Send voice message CG
		CG Scan	monitor + update C4 display
34.69	163.74	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send voice message CG
37	69.99	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
39	7	Commo with HQ	Assess Situation CG
42	9.6	CG Scan	Scan (random 2-5s) CG
43.26	38.67	CG Scan	Scan (random 2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
47	14.7	CG Scan	monitor + update C4 display
48	64.29	CG Scan	monitor + update C4 display
		Commo with HQ	Receive Voice Message CG
50	101.97	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Assess Situation CG
52	85.22	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Assess Situation CG
		CG Scan	Scan (random 2-5s) CG
53.56	158.2	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random 2-5s) CG
		Commo with HQ	Assess Situation CG
55	52.72	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
59	71.98	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send voice message CG
62	57.87	Commo with HQ	Send voice message CG
		CG Scan	Scan (random 2-5s) CG
66.56	11.3	Crew commo in vehicle	CG hears D message via intercom
68	45	Maintain awareness of enemy, own units	CG looks at enemy location on
		Crew commo in vehicle	CG hears D message via intercom
69	124.2	Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
71	159.34	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Receive Digital Message CG
74	76.89	Commo with HQ	Send voice message CG
		CG Scan	monitor + update C4 display
78.95	11.5	Crew commo in vehicle	CG talks via intercom
82	9.6	CG Scan	Scan (random 2-5s) CG
84	66.38	CG Scan	Scan (random 2-5s) CG
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
88	15.5	Commo with HQ	Send voice message CG
89	66.76	Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Send voice message CG
92	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
92.96	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
97	38.67	Crew commo in vehicle	CG hears D message via intercom

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		CG Scan	Scan (random 2-5s) CG
101	58.01	CG Scan	monitor + update C4 display
		Commo with HQ	Send Digital Message CG
103.03	54.08	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
105	54.6	Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
108	124.2	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
109	48.96	CG Scan	Scan (random 2-5s) CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
110	52.32	Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	Scan (random 2-5s) CG
111	65.32	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Digital Message CG
112.01	130.5	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
113	69.62	CG Scan	monitor + update C4 display
		Commo with HQ	Receive Digital Message CG
115	38.79	Commo with HQ	Assess Situation CG
		CG Scan	monitor + update C4 display
118	35	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
121	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
124	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on
125	134.87	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
		CG Scan	monitor + update C4 display
125.35	228.44	Crew commo in vehicle	CG talks via intercom
		CG Scan	monitor + update C4 display
		Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
126	237.84	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
130	77.92	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
134	29.66	Commo with HQ	Assess Situation CG
		CG Scan	Scan (random 2-5s) CG
137.43	11.5	Crew commo in vehicle	CG talks via intercom
138	42.09	CG Scan	Scan (random 2-5s) CG
		Crew commo in vehicle	CG talks via intercom
141	48.76	Maintain awareness of enemy, own units	CG looks at enemy location on

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Crew commo in vehicle	CG talks via intercom
143	50.88	Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Send Digital Message CG
145	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
150	9.6	CG Scan	Scan (random 2-5s) CG
151.19	38.67	CG Scan	Scan (random 2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
153	45	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on
155	77.92	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares enemy location to own location
155.78	151.95	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
160	9.2	Commo with HQ	Send Digital Message CG
162	44.04	Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random 2-5s) CG
164	101.48	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random 2-5s) CG
		Commo with HQ	Send Digital Message CG
170.31	11.3	Crew commo in vehicle	CG hears D message via intercom
171	45	Maintain awareness of enemy, own units	CG looks at enemy location on
		Crew commo in vehicle	CG hears D message via intercom
172	109.15	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Send Digital Message CG
173	55	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Send Digital Message CG
176	9.6	CG Scan	Scan (random 2-5s) CG
181	13.5	Commo with HQ	Receive Digital Message CG
183	53.93	CG Scan	Scan (random 2-5s) CG
		Commo with HQ	Receive Digital Message CG
183.79	116.96	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Digital Message CG
		CG Scan	Scan (random 2-5s) CG
188	13.5	Commo with HQ	Receive Voice Message CG
192.74	11.5	Crew commo in vehicle	CG talks via intercom
193	48.76	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on
194	147.41	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on
194	147.41	Commo with HQ	Send voice message CG
197	129.19	CG Scan	Scan (random 2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Receive Digital Message CG

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
198	135.27	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Receive Digital Message CG
		CG Scan	Scan (random 2-5s) CG
198.5	218.22	CG Scan	Scan (random 2-5s) CG
		Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
201	32.11	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
204	52.4	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Receive Voice Message CG
204.04	115.25	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Voice Message CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
205	121.05	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG hears D message via intercom
207	87.01	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
209	184.78	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Assess Situation CG
211.03	54.08	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom
214	45.57	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
215	109.15	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
217	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
217.05	48.58	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG hears D message via intercom
219	201.03	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random 2-5s) CG
221	37.82	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
222.38	32.11	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
224	45.57	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
225	44.04	CG Scan	Scan (random 2-5s) CG

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Commo with HQ	Send Digital Message CG
228	66.38	CG Scan	Scan (random 2-5s) CG
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
228.82	137.36	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random 2-5s) CG
231	33.53	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Assess Situation CG
232	86.99	Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG talks via intercom
235	61.68	Maintain awareness of enemy, own units	CG looks at enemy location on
		CG Scan	monitor + update C4 display
236	65.8	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares enemy location to own location
238.84	11.3	Crew commo in vehicle	CG hears D message via intercom
239	54.08	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
240	122.96	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG looks at enemy location on
		Crew commo in vehicle	CG hears D message via intercom
241	109.15	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on
242	183.3	Engage Targets	CG confirm thru target acq scr
		Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on
243	160.84	Engage Targets	CG makes decision about target
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
243.07	196.81	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
		Engage Targets	CG select firing position
		Crew commo in vehicle	CG hears D message via intercom
244	110.72	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
		Engage Targets	CG select firing position
245	149.66	Engage Targets	CG select firing position
		Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
245.07	112.66	Commo with HQ	Send voice message CG
		Engage target while	CG issues fire CMD voice
		Maintain awareness of enemy, own units	CG compares enemy location to own location

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
246.07	138.49	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage target while	CG selects weapon system
		Commo with HQ	Send voice message CG
247.07	44.36	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage target while	CG select ammo
248.07	44.36	Engage target while	CG arms main weapon
		Maintain awareness of enemy, own units	CG compares enemy location to own location
249.07	11.2	Engage target while	CG Lays Main Gun on Tgt
249.67	42.83	Engage target while	CG Lays Main Gun on Tgt
		Crew commo in vehicle	CG hears D message via intercom
250.07	33.75	Crew commo in vehicle	CG hears D message via intercom
		Engage target while	CG says fire
251.07	42.17	Engage target while	CG fires at tgt
		Crew commo in vehicle	CG hears D message via intercom
252	100.68	Commo with HQ	Send Digital Message CG
		Engage target while	CG fires at tgt
		Crew commo in vehicle	CG hears D message via intercom
252.07	121.78	Crew commo in vehicle	CG hears D message via intercom
		Engage target while	CG inputs updated SITREP
		Commo with HQ	Send Digital Message CG
258.03	58.98	Crew commo in vehicle	CG talks via intercom
		Engage target while	CG inputs updated SITREP
260	132.38	Engage target while	CG inputs updated SITREP
		Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
261	240.84	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG talks via intercom
		Engage target while	CG inputs updated SITREP
		Commo with HQ	Send Digital Message CG
264.46	240.84	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
		Engage target while	CG inputs updated SITREP
274.23	58.98	Engage target while	CG inputs updated SITREP
		Crew commo in vehicle	CG talks via intercom
275	128.92	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
		Engage target while	CG inputs updated SITREP
276	232.2	Engage target while	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
278	68.6	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage target while	CG inputs updated SITREP
280	162.1	Engage target while	CG inputs updated SITREP

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Receive Digital Message CG
284	40.31	Engage target while	CG inputs updated SITREP
		Commo with HQ	Assess Situation CG
284.6	88.54	Engage target while	CG inputs updated SITREP
		Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
290	62.29	Commo with HQ	Send Digital Message CG
		Engage target while	CG inputs updated SITREP
292.79	51.72	Engage target while	CG inputs updated SITREP
		Crew commo in vehicle	CG hears D message via intercom
297	62.55	Engage target while	CG inputs updated SITREP
		Commo with HQ	Receive Voice Message CG
299.25	134.16	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Voice Message CG
		Engage target while	CG inputs updated SITREP
301	186.62	Engage target while	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Assess Situation CG
306	68.6	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Engage target while	CG inputs updated SITREP
310.17	58.98	Crew commo in vehicle	CG talks via intercom
		Engage target while	CG inputs updated SITREP
311	156.02	Engage target while	CG inputs updated SITREP
		Commo with HQ	Receive Digital Message CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
312.07	129.19	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random 2-5s) CG
		Commo with HQ	Receive Digital Message CG
313	85.22	CG Scan	Scan (random 2-5s) CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Assess Situation CG
314	90	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	Scan (random 2-5s) CG
318.45	11.3	Crew commo in vehicle	CG hears D message via intercom
320	45.57	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
325	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on
327	52.4	Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Receive Voice Message CG
328	56.02	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Receive Voice Message CG
328.1	121.05	Crew commo in vehicle	CG hears D message via intercom

Workload Profile for CG During Combat Scenario			
Time	Total Workload	Function Name	Task Name
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Receive Voice Message CG
336	9.2	Commo with HQ	Send Digital Message CG
337.72	45.57	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
344.13	11.5	Crew commo in vehicle	CG talks via intercom
345	55.54	Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG talks via intercom
348	33.53	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Assess Situation CG
350	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on
351	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
351.58	52.72	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
359.13	11.3	Crew commo in vehicle	CG hears D message via intercom
360	54.6	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
369.73	11.3	Crew commo in vehicle	CG hears D message via intercom
371	65.55	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
373	138.71	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Send voice message CG
375	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
376.19	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
382	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
382.37	69.99	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
385.89	11.5	Crew commo in vehicle	CG talks via intercom
388	70.69	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send voice message CG
394	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on
397	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
399	13.5	Commo with HQ	Receive Voice Message CG
401	7	Commo with HQ	Assess Situation CG
401.88	32.11	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
410	9.2	Commo with HQ	Send Digital Message CG
410.39	45.65	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
417	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
420	146.85	Commo with HQ	Send voice message CG
		Engage Targets	CG detects target stop scan
		Maintain awareness of enemy, own units	CG compares other friendly to own location

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
421	54.25	Engage Targets	CG confirm thru target acq scr
		Commo with HQ	Send voice message CG
422	45.09	Commo with HQ	Send voice message CG
		Engage Targets	CG makes decision about target
422.07	62.76	Engage Targets	CG select firing position
		Commo with HQ	Send voice message CG
422.58	133.33	Crew commo in vehicle	CG hears D message via intercom
		Engage Targets	CG select firing position
		Commo with HQ	Send voice message CG
424	62.76	Engage Targets	CG select firing position
		Commo with HQ	Send voice message CG
424.07	41.02	Engage target while	CG issues fire CMD voice
		Commo with HQ	Send voice message CG
425.07	54.25	Engage target while	CG selects weapon system
		Commo with HQ	Send voice message CG
426	45.8	Maintain awareness of enemy, own units	CG looks at his unit on map
		Engage target while	CG selects weapon system
426.07	41	Maintain awareness of enemy, own units	CG looks at his unit on map
		Engage target while	CG select ammo
427.07	41	Engage target while	CG arms main weapon
		Maintain awareness of enemy, own units	CG looks at his unit on map
428.07	52.8	Engage target while	CG Lays Main Gun on Tgt
		Maintain awareness of enemy, own units	CG looks at his unit on map
429.07	34.84	Engage target while	CG says fire
		Maintain awareness of enemy, own units	CG looks at his unit on map
430.07	46.08	Engage target while	CG fires at tgt
		Maintain awareness of enemy, own units	CG looks at his unit on map
431	50.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Engage target while	CG fires at tgt
432.52	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
435	54.6	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
438.6	11.5	Crew commo in vehicle	CG talks via intercom
441	15.5	Commo with HQ	Send voice message CG
441.07	79.05	Commo with HQ	Send voice message CG
		Engage target while	CG inputs updated SITREP
441.83	164.42	Commo with HQ	Send voice message CG
		Engage target while	CG inputs updated SITREP
		Crew commo in vehicle	CG talks via intercom
446	164.42	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send voice message CG
		Engage target while	CG inputs updated SITREP
450	65.24	Engage target while	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at his unit on map

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
452	140.11	Engage target while	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send Digital Message CG
453.21	221.5	Commo with HQ	Send Digital Message CG
		Engage target while	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG hears D message via intercom
454	229.76	Engage target while	CG inputs updated SITREP
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
462.96	58.98	Crew commo in vehicle	CG talks via intercom
		Engage target while	CG inputs updated SITREP
465	234.66	Maintain awareness of enemy, own units	CG looks at his unit on map
		Engage target while	CG inputs updated SITREP
		Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG talks via intercom
467	143.17	Engage target while	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Voice Message CG
468	109.23	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Engage target while	CG inputs updated SITREP
476.6	51.72	Crew commo in vehicle	CG hears D message via intercom
		Engage target while	CG inputs updated SITREP
478	152.22	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
		Engage target while	CG inputs updated SITREP
480	65.24	Engage target while	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at his unit on map
482.56	132.38	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Engage target while	CG inputs updated SITREP
485	138.3	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG talks via intercom
		Engage target while	CG inputs updated SITREP
489	65.24	Maintain awareness of enemy, own units	CG looks at enemy location on
		Engage target while	CG inputs updated SITREP
490	156.02	Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Receive Digital Message CG
		Engage target while	CG inputs updated SITREP
492	104.45	Engage target while	CG inputs updated SITREP
		Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
493	109.23	Commo with HQ	Assess Situation CG

Workload Profile for CG During Combat Scenario			
Time	Total Workload	Function Name	Task Name
		Engage target while	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG compares enemy location to own location
495.4	127.1	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage target while	CG inputs updated SITREP
498.78	51.72	Engage target while	CG inputs updated SITREP
		Crew commo in vehicle	CG hears D message via intercom
500	62.29	Commo with HQ	Send Digital Message CG
		Engage target while	CG inputs updated SITREP
501.07	44.04	Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random 2-5s) CG
508	13.5	Commo with HQ	Receive Voice Message CG
510	7	Commo with HQ	Assess Situation CG
510.33	33.53	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG talks via intercom
513	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on
515.23	45	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on
516	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
518	15.5	Commo with HQ	Send voice message CG
518.94	65.55	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
530	13.5	Commo with HQ	Receive Digital Message CG
531.22	54.6	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
533	61.2	Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Receive Digital Message CG
534	35	Maintain awareness of enemy, own units	CG looks at enemy location on
		Commo with HQ	Assess Situation CG
536.91	82.01	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
		Crew commo in vehicle	CG hears D message via intercom
538	48.58	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
539	65.55	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG hears D message via intercom
543	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
545	7	Commo with HQ	Assess Situation CG
550.48	11.3	Crew commo in vehicle	CG hears D message via intercom
552	138.71	Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
		Crew commo in vehicle	CG hears D message via intercom
555	71.98	Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location

Workload Profile for CG During Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
558.89	11.5	Crew commo in vehicle	CG talks via intercom
565	45.65	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
570	13.5	Commo with HQ	Receive Digital Message CG
571	61.2	Commo with HQ	Receive Digital Message CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
574	35	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Assess Situation CG
575	37.82	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Assess Situation CG
576.4	92.37	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Assess Situation CG
578	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
579	73.8	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG looks at enemy location on
581	35	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG looks at enemy location on
583	37.82	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
590	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on
591.26	48.76	Maintain awareness of enemy, own units	CG looks at enemy location on
		Crew commo in vehicle	CG talks via intercom
592	52.72	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
593	155.19	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
599.92	8.2	Crew commo in vehicle	CG hears D message via intercom

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Appendix B. Data for Condition 2: Automated Scanning Scenario

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
2	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
10	11.5	Crew commo in vehicle	CG talks via intercom
15	15.5	Commo with HQ	Send voice message CG
16	66.76	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send voice message CG
18	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
22	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
24.95	11.3	Crew commo in vehicle	CG hears D message via intercom
32	15.5	Commo with HQ	Send voice message CG
33	66.76	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send voice message CG
36.24	45	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
38	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
39	45.57	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
42.63	11.3	Crew commo in vehicle	CG hears D message via intercom
46	9.2	Commo with HQ	Send Digital Message CG
48.42	45.65	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send Digital Message CG
49	48.76	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
51	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
53.05	11.5	Crew commo in vehicle	CG talks via intercom
58	54.93	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Voice Message CG
62	7	Commo with HQ	Assess Situation CG
65	35	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Assess Situation CG
68.19	45	Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG hears D message via intercom
70	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
74	9.2	Commo with HQ	Send Digital Message CG

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
74.56	45.65	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send Digital Message CG
75	112.79	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
80	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
84	9.2	Commo with HQ	Send Digital Message CG
85.53	45.65	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send Digital Message CG
92.48	11.5	Crew commo in vehicle	CG talks via intercom
96	55.54	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Digital Message CG
99	7	Commo with HQ	Assess Situation CG
102	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
103.6	48.76	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG talks via intercom
106	52.72	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
107	71.98	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Send voice message CG
110.7	65.55	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
113	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
116.6	69.99	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
117	33.53	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Assess Situation CG
118	86.99	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
119	52.72	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG talks via intercom
123	48.76	Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG talks via intercom
124	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
127	15.5	Commo with HQ	Send voice message CG
127.3	70.69	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
130	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
132	73.8	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG looks at his unit on map
134	145.65	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
134	82.01	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Assess Situation CG
135	87.01	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
139	11.3	Crew commo in vehicle	CG hears D message via intercom
143	9.2	Commo with HQ	Send Digital Message CG
145.3	45.65	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send Digital Message CG
148	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
149	73.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
152	66.76	Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
152.9	138.71	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
153	146.11	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
160	9.2	Commo with HQ	Send Digital Message CG
166	11.5	Crew commo in vehicle	CG talks via intercom
168	69.99	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
171	9.2	Commo with HQ	Send Digital Message CG
172	45.65	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send Digital Message CG
174	112.79	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
178	61.2	Commo with HQ	Receive Digital Message CG

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Maintain awareness of enemy, own units	CG looks at his unit on map
179	65.32	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Digital Message CG
179.3	135.38	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Digital Message CG
180	92.37	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Assess Situation CG
188	13.5	Commo with HQ	Receive Voice Message CG
191.2	11.3	Crew commo in vehicle	CG hears D message via intercom
194	11.3	Crew commo in vehicle	CG hears D message via intercom
195	45	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
196	66.76	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send voice message CG
198	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
199	77.92	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
203.1	11.5	Crew commo in vehicle	CG talks via intercom
212	15.5	Commo with HQ	Send voice message CG
214.9	65.55	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
219	45	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
220	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
222	11.3	Crew commo in vehicle	CG hears D message via intercom
224	45.57	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
227.2	11.3	Crew commo in vehicle	CG hears D message via intercom
234	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
234.6	69.99	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Crew commo in vehicle	CG talks via intercom
240	45.12	Commo with HQ	Send Digital Message CG
		Engage Targets	CG detects target stop scan
241	108.08	Engage Targets	CG confirm thru target acq scr
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send Digital Message CG

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
242	94.52	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send Digital Message CG
		Engage Targets	CG makes decision about target
242.1	123.96	Engage Targets	CG select firing position
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send Digital Message CG
244.1	31.36	Engage target while moving	CG issues fire CMD voice
		Maintain awareness of enemy, own units	CG compares other friendly to own location
245.1	49.16	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Engage target while moving	CG selects weapon system
246.1	44.36	Engage target while moving	CG select ammo
		Maintain awareness of enemy, own units	CG compares other friendly to own location
247.1	6.2	Engage target while moving	CG arms main weapon
247.2	35.89	Engage target while moving	CG arms main weapon
		Crew commo in vehicle	CG talks via intercom
248.1	46.77	Crew commo in vehicle	CG talks via intercom
		Engage target while moving	CG Lays Main Gun on Tgt
249.1	40.37	Engage target while moving	CG says fire
		Crew commo in vehicle	CG talks via intercom
250	127.44	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Crew commo in vehicle	CG talks via intercom
		Engage target while moving	CG says fire
250.1	142.64	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Engage target while moving	CG fires at tgt
251.1	84.63	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Engage target while moving	CG inputs updated SITREP
253	40.31	Commo with HQ	Assess Situation CG
		Engage target while moving	CG inputs updated SITREP
255.4	88.54	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
		Engage target while moving	CG inputs updated SITREP
266	65.24	Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at his unit on map
267	166.45	Commo with HQ	Send voice message CG
		Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at his unit on map
270	68.6	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Engage target while moving	CG inputs updated SITREP
270.2	138.3	Maintain awareness of enemy, own units	CG compares other friendly to own location

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Engage target while moving	CG inputs updated SITREP
		Crew commo in vehicle	CG talks via intercom
275	132.38	Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG talks via intercom
276	174.57	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Engage target while moving	CG inputs updated SITREP
277	180.65	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Engage target while moving	CG inputs updated SITREP
280.3	127.1	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Engage target while moving	CG inputs updated SITREP
285	79.05	Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Send voice message CG
285.5	164.42	Crew commo in vehicle	CG talks via intercom
		Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Send voice message CG
289	79.05	Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Send voice message CG
290.5	164.42	Crew commo in vehicle	CG talks via intercom
		Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Send voice message CG
294	132.38	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Engage target while moving	CG inputs updated SITREP
296	138.3	Crew commo in vehicle	CG talks via intercom
		Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG compares other friendly to own location
298.4	58.98	Crew commo in vehicle	CG talks via intercom
		Engage target while moving	CG inputs updated SITREP
299	164.8	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Engage target while moving	CG inputs updated SITREP
		Crew commo in vehicle	CG talks via intercom
301.9	164.8	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Engage target while moving	CG inputs updated SITREP
302	40.31	Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Assess Situation CG
304	104.45	Commo with HQ	Assess Situation CG
		Engage target while moving	CG inputs updated SITREP

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Maintain awareness of enemy, own units	CG looks at enemy location on map
308	68.6	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage target while moving	CG inputs updated SITREP
312.1	11.3	Crew commo in vehicle	CG hears D message via intercom
314	50.88	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
319	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
321.1	11.5	Crew commo in vehicle	CG talks via intercom
325	48.76	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
327	155.19	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
331	56.02	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Voice Message CG
334	11.5	Crew commo in vehicle	CG talks via intercom
341	9.2	Commo with HQ	Send Digital Message CG
344.9	11.5	Crew commo in vehicle	CG talks via intercom
346	48.76	Maintain awareness of enemy, own units	CG looks at enemy location on map
346	48.76	Crew commo in vehicle	CG talks via intercom
348	52.72	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG talks via intercom
352	55	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Send Digital Message CG
357.8	11.5	Crew commo in vehicle	CG talks via intercom
362	45.65	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
367	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
369	45	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
369	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
373	54.6	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
379.5	11.3	Crew commo in vehicle	CG hears D message via intercom
382	124.2	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
386	82.01	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Assess Situation CG
387	37.82	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
392.4	11.3	Crew commo in vehicle	CG hears D message via intercom
394	54.45	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Voice Message CG
396	115.25	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Voice Message CG
397	82.01	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
398	87.01	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
400.5	32.11	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
408	15.5	Commo with HQ	Send voice message CG
415.7	11.3	Crew commo in vehicle	CG hears D message via intercom
416	54.45	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Voice Message CG
417	115.25	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Voice Message CG
419	82.01	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
421	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
422	49.16	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage Targets	CG confirm thru C4 display
423	37.34	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage Targets	CG makes decision about target
423.1	54.82	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage Targets	CG select firing position
425.1	3	Engage target while moving	CG issues fire CMD voice
426	31.42	Commo with HQ	Receive Digital Message CG
		Engage target while moving	CG issues fire CMD voice
426.1	50.49	Engage target while moving	CG selects weapon system

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Commo with HQ	Receive Digital Message CG
427.1	45.29	Engage target while moving	CG select ammo
		Commo with HQ	Receive Digital Message CG
427.7	101.94	Crew commo in vehicle	CG hears D message via intercom
		Engage target while moving	CG select ammo
		Commo with HQ	Receive Digital Message CG
428.1	101.94	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
		Engage target while moving	CG arms main weapon
429.1	119.88	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
		Engage target while moving	CG Lays Main Gun on Tgt
430	78.22	Commo with HQ	Assess Situation CG
		Engage target while moving	CG Lays Main Gun on Tgt
		Crew commo in vehicle	CG hears D message via intercom
430.1	65.58	Engage target while moving	CG says fire
		Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
431.1	77.7	Engage target while moving	CG fires at tgt
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
433.8	32.11	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
435	69.95	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
438	32.11	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
440.9	32.11	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
445	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
447	66.76	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send voice message CG
448	71.98	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send voice message CG
451.2	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
455	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
456.6	69.99	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Crew commo in vehicle	CG talks via intercom
457	33.53	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG talks via intercom
461	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
462.1	65.24	Maintain awareness of enemy, own units	CG looks at his unit on map

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Engage target while moving	CG inputs updated SITREP
463	68.6	Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG compares other friendly to own location
465	143.17	Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Voice Message CG
468	40.31	Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Assess Situation CG
470.6	51.72	Crew commo in vehicle	CG hears D message via intercom
		Engage target while moving	CG inputs updated SITREP
480	62.29	Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Send Digital Message CG
481.9	121.78	Crew commo in vehicle	CG hears D message via intercom
		Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Send Digital Message CG
482	221.5	Commo with HQ	Send Digital Message CG
		Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
483	229.76	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage target while moving	CG inputs updated SITREP
		Crew commo in vehicle	CG hears D message via intercom
490.9	51.72	Crew commo in vehicle	CG hears D message via intercom
		Engage target while moving	CG inputs updated SITREP
492	152.22	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG hears D message via intercom
		Engage target while moving	CG inputs updated SITREP
498.8	58.98	Engage target while moving	CG inputs updated SITREP
		Crew commo in vehicle	CG talks via intercom
503	62.55	Commo with HQ	Receive Voice Message CG
		Engage target while moving	CG inputs updated SITREP
504	137.59	Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Receive Voice Message CG
505	143.17	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Receive Voice Message CG
508.8	127.1	Crew commo in vehicle	CG hears D message via intercom
		Engage target while moving	CG inputs updated SITREP
		Maintain awareness of enemy, own units	CG compares enemy location to own location
513.7	58.98	Engage target while moving	CG inputs updated SITREP
		Crew commo in vehicle	CG talks via intercom
514	277.28	Maintain awareness of enemy, own units	CG looks at enemy location on map

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send voice message CG
		Engage target while moving	CG inputs updated SITREP
516	287.02	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Engage target while moving	CG inputs updated SITREP
		Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
519.9	58.98	Crew commo in vehicle	CG talks via intercom
		Engage target while moving	CG inputs updated SITREP
521	144.4	Engage target while moving	CG inputs updated SITREP
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Digital Message CG
524.6	11.5	Crew commo in vehicle	CG talks via intercom
525	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
528	50.88	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send Digital Message CG
530	55	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send Digital Message CG
533	56.02	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Voice Message CG
533.8	121.05	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG hears D message via intercom
535	32.11	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
536	82.01	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
540	50.88	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send Digital Message CG
541	55	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send Digital Message CG
546.6	11.3	Crew commo in vehicle	CG hears D message via intercom
548	54.45	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Voice Message CG
555	66.76	Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
558	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
562.8	11.5	Crew commo in vehicle	CG talks via intercom
568	13.5	Commo with HQ	Receive Voice Message CG
571	7	Commo with HQ	Assess Situation CG

Workload Profile for CG during Automated Scanning Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
572.5	33.53	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG talks via intercom
576	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
579	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
583	71.98	Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
584.7	70.69	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
590	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
591.4	45	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
592	145.65	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
593	151.95	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
597	45.57	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom

Appendix C. Data for Condition 3: Combat, No Engagements Scenario

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
0	14.7	CG Scan	monitor + update C4 display
3	58.01	Commo with HQ	Send Digital Message CG
		CG Scan	monitor + update C4 display
8	13.5	Commo with HQ	Receive Digital Message CG
9	54.6	Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
12	32.11	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
14	38.67	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
15.89	42.09	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
16	106.91	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random2-5s) CG
18	244.18	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG looks at his unit on map
19	155.93	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG talks via intercom
21	7	Commo with HQ	Assess Situation CG
23	29.66	Commo with HQ	Assess Situation CG
		CG Scan	Scan (random2-5s) CG
25	48.96	Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	Scan (random2-5s) CG
25.12	99.93	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
29	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
31	14.7	CG Scan	monitor + update C4 display
31.06	57.86	Crew commo in vehicle	CG talks via intercom
		CG Scan	monitor + update C4 display
34	76.89	Commo with HQ	Send voice message CG
		CG Scan	monitor + update C4 display
34.69	163.74	Commo with HQ	Send voice message CG
		CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
37	69.99	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
39	7	Commo with HQ	Assess Situation CG
42	9.6	CG Scan	Scan (random2-5s) CG
43.26	38.67	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
47	14.7	CG Scan	monitor + update C4 display
48	64.29	Commo with HQ	Receive Voice Message CG

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		CG Scan	monitor + update C4 display
50	101.97	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Assess Situation CG
52	85.22	Commo with HQ	Assess Situation CG
		CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
53.56	158.2	Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
		Commo with HQ	Assess Situation CG
55	52.72	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
59	71.98	Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
62	57.87	Commo with HQ	Send voice message CG
		CG Scan	Scan (random2-5s) CG
66.56	11.3	Crew commo in vehicle	CG hears D message via intercom
68	45	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
69	124.2	Commo with HQ	Receive Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
71	159.34	Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	monitor + update C4 display
		Commo with HQ	Receive Digital Message CG
74	76.89	Commo with HQ	Send voice message CG
		CG Scan	monitor + update C4 display
78.95	11.5	Crew commo in vehicle	CG talks via intercom
82	9.6	CG Scan	Scan (random2-5s) CG
84	66.38	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		CG Scan	Scan (random2-5s) CG
88	15.5	Commo with HQ	Send voice message CG
89	66.76	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send voice message CG
92	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
92.96	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
97	38.67	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
101	58.01	Commo with HQ	Send Digital Message CG
		CG Scan	monitor + update C4 display
103.03	54.08	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom
105	54.6	Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
108	124.2	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
109	48.96	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
110	52.32	CG Scan	Scan (random2-5s) CG

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Maintain awareness of enemy, own units	CG compares other friendly to own location
111	65.32	Commo with HQ	Receive Digital Message CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
112.01	130.5	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
113	69.62	CG Scan	monitor + update C4 display
		Commo with HQ	Receive Digital Message CG
115	38.79	Commo with HQ	Assess Situation CG
		CG Scan	monitor + update C4 display
118	35	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Assess Situation CG
121	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
124	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
125	134.87	Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	monitor + update C4 display
		Commo with HQ	Send Digital Message CG
125.35	228.44	Crew commo in vehicle	CG talks via intercom
		CG Scan	monitor + update C4 display
		Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
126	237.84	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
130	77.92	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares enemy location to own location
134	29.66	Commo with HQ	Assess Situation CG
		CG Scan	Scan (random2-5s) CG
137.43	11.5	Crew commo in vehicle	CG talks via intercom
138	42.09	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
141	48.76	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG talks via intercom
143	50.88	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send Digital Message CG
145	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
150	9.6	CG Scan	Scan (random2-5s) CG
151.19	38.67	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
153	45	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
155	77.92	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares enemy location to own location
155.78	151.95	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares enemy location to own location
160	9.2	Commo with HQ	Send Digital Message CG
162	44.04	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Send Digital Message CG
164	101.48	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Commo with HQ	Send Digital Message CG
170.31	11.3	Crew commo in vehicle	CG hears D message via intercom
171	45	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
172	109.15	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send Digital Message CG
173	55	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Send Digital Message CG
176	9.6	CG Scan	Scan (random2-5s) CG
181	13.5	Commo with HQ	Receive Digital Message CG
183	53.93	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Receive Digital Message CG
183.79	116.96	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG talks via intercom
188	13.5	Commo with HQ	Receive Voice Message CG
192.74	11.5	Crew commo in vehicle	CG talks via intercom
193	48.76	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG talks via intercom
194	147.41	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
197	129.19	Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	Scan (random2-5s) CG
		Commo with HQ	Receive Digital Message CG
198	135.27	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Receive Digital Message CG
198.5	218.22	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
201	32.11	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
204	52.4	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Receive Voice Message CG
204.04	115.25	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Voice Message CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
205	121.05	Commo with HQ	Receive Voice Message CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG hears D message via intercom
207	87.01	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
209	184.78	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
211.03	54.08	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
214	45.57	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
215	109.15	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send Digital Message CG
217	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
217.05	48.58	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG hears D message via intercom
219	201.03	Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	Scan (random2-5s) CG
221	37.82	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
222.38	32.11	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
224	45.57	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
225	44.04	Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random2-5s) CG
228	66.38	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		CG Scan	Scan (random2-5s) CG
228.82	137.36	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
231	33.53	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Assess Situation CG
232	86.99	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Assess Situation CG
235	61.68	Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	monitor + update C4 display
236	65.8	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares enemy location to own location
238.84	11.3	Crew commo in vehicle	CG hears D message via intercom
239	54.08	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom
240	122.96	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG looks at enemy location on map
241	109.15	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
244	48.58	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
246	55	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Send Digital Message CG
247.67	115.45	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
250	54.08	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
253	15.5	Commo with HQ	Send voice message CG
257	9.6	CG Scan	Scan (random2-5s) CG
261.74	38.67	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
262	69.95	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Crew commo in vehicle	CG hears D message via intercom
266	7	Commo with HQ	Assess Situation CG
268	85.22	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random2-5s) CG
		Commo with HQ	Assess Situation CG
268.75	150	Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
		CG Scan	Scan (random2-5s) CG
271	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
273	71.98	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send voice message CG
275	9.6	CG Scan	Scan (random2-5s) CG
276.73	42.09	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
281	13.5	Commo with HQ	Receive Digital Message CG
282.8	54.6	Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
285	85.22	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random2-5s) CG
		Commo with HQ	Assess Situation CG
286	90	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
290	15.5	Commo with HQ	Send voice message CG
292.86	70.69	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send voice message CG
294	42.09	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
297.79	11.3	Crew commo in vehicle	CG hears D message via intercom
299	115.25	Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
302	37.82	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
304.73	48.58	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG hears D message via intercom
305	54.08	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
310	13.5	Commo with HQ	Receive Voice Message CG
313	7	Commo with HQ	Assess Situation CG
313.57	33.53	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG talks via intercom
315	42.09	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
321	15.5	Commo with HQ	Send voice message CG

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
324	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
325	61.68	Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	monitor + update C4 display
325.4	122.96	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG looks at enemy location on map
329	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
330	65.32	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Receive Digital Message CG
334	7	Commo with HQ	Assess Situation CG
338	14.7	CG Scan	monitor + update C4 display
338.4	57.86	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
341	70.69	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
348	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
350	38.79	CG Scan	monitor + update C4 display
		Commo with HQ	Assess Situation CG
353	101.97	CG Scan	monitor + update C4 display
		Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
354	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
354.89	52.72	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
358	70.69	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
359	57.87	Commo with HQ	Send voice message CG
		CG Scan	Scan (random2-5s) CG
362.41	42.09	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
367	48.76	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
368	149.25	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
371.15	45	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
372	105.47	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
373	235.77	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG
376	9.6	CG Scan	Scan (random2-5s) CG
383	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
384	48.96	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random2-5s) CG
385	129.19	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Receive Digital Message CG
386	135.27	Commo with HQ	Receive Digital Message CG

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	Scan (random2-5s) CG
387	90	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Assess Situation CG
		CG Scan	Scan (random2-5s) CG
387.12	165.54	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Assess Situation CG
393	9.6	CG Scan	Scan (random2-5s) CG
394	44.04	Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random2-5s) CG
395.07	45.65	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
399	14.7	CG Scan	monitor + update C4 display
402	64.29	CG Scan	monitor + update C4 display
		Commo with HQ	Receive Voice Message CG
403.96	133.32	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
		Commo with HQ	Receive Voice Message CG
407	14.7	CG Scan	monitor + update C4 display
408	61.68	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG looks at enemy location on map
413	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
413.83	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
414	130.5	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Digital Message CG
417	7	Commo with HQ	Assess Situation CG
418	38.79	CG Scan	monitor + update C4 display
		Commo with HQ	Assess Situation CG
424	9.6	CG Scan	Scan (random2-5s) CG
425	42.09	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
428	70.69	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
432	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
435	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
436.45	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
437	105.47	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG
438	235.77	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG hears D message via intercom
445.34	11.5	Crew commo in vehicle	CG talks via intercom
449	9.6	CG Scan	Scan (random2-5s) CG
450	57.87	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Send voice message CG

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
457.65	11.3	Crew commo in vehicle	CG hears D message via intercom
459	145.65	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
461	237.36	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
464	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
465	77.92	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares enemy location to own location
467.37	155.93	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
470	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
472	52.32	Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG
473	135.27	Commo with HQ	Receive Digital Message CG
		CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
477	7	Commo with HQ	Assess Situation CG
477.89	33.53	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Assess Situation CG
483	9.6	CG Scan	Scan (random2-5s) CG
485	48.96	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
486	113.28	Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
486.36	189.32	CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send Digital Message CG
489	115.45	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
492.44	11.5	Crew commo in vehicle	CG talks via intercom
496	13.5	Commo with HQ	Receive Voice Message CG
497	46.19	Commo with HQ	Receive Voice Message CG
		CG Scan	Scan (random2-5s) CG
501	14.7	CG Scan	monitor + update C4 display
502.38	57.86	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
503	130.3	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
504	136.98	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG talks via intercom
509	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
514	9.2	Commo with HQ	Send Digital Message CG
515	58.01	Commo with HQ	Send Digital Message CG

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		CG Scan	monitor + update C4 display
516.23	54.08	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom
524	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
526	77.92	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares other friendly to own location
527	181.79	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares other friendly to own location
527.32	283.9	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
533	14.7	CG Scan	monitor + update C4 display
533.01	54.08	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
534	76.89	Commo with HQ	Send voice message CG
		CG Scan	monitor + update C4 display
540	9.6	CG Scan	Scan (random2-5s) CG
540.04	42.09	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
546	9.2	Commo with HQ	Send Digital Message CG
547	44.04	Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random2-5s) CG
548	113.28	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random2-5s) CG
		Commo with HQ	Send Digital Message CG
551	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
551.67	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
553	105.47	Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
555	66.38	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
557.35	11.3	Crew commo in vehicle	CG hears D message via intercom
558	54.08	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom
561	76.89	Commo with HQ	Send voice message CG
		CG Scan	monitor + update C4 display
564.01	11.3	Crew commo in vehicle	CG hears D message via intercom
570	46.19	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Receive Voice Message CG
573	48.96	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
574	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
577	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
577.09	45	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
579	48.58	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
583	98.18	Crew commo in vehicle	CG hears D message via intercom

Workload Profile for CG during Baseline Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		CG Scan	Scan (random2-5s) CG
		Commo with HQ	Send Digital Message CG
584	113.28	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random2-5s) CG
588	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
589	55	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
592.35	115.45	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG hears D message via intercom
595	45	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
598	52.32	Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG

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Appendix D. Data for Condition 4: Non-Combat Scenario

Workload Profile for CG during Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
0	9.6	CG Scan	Scan (random2-5s) CG
6	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
9	66.76	Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
11	146.11	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
20	14.7	CG Scan	monitor + update C4 display
25	9.2	Commo with HQ	Send Digital Message CG
31	14.7	CG Scan	monitor + update C4 display
31.62	57.86	Crew commo in vehicle	CG talks via intercom
		CG Scan	monitor + update C4 display
32	143.32	Commo with HQ	Receive Digital Message CG
		CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
37	7	Commo with HQ	Assess Situation CG
40	35	Commo with HQ	Assess Situation CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
46.51	45	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
48	48.58	Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
49	129.26	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Crew commo in vehicle	CG hears D message via intercom
55	9.6	CG Scan	Scan (random2-5s) CG
57	44.04	Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random2-5s) CG
64.52	11.3	Crew commo in vehicle	CG hears D message via intercom
73	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
75	7	Commo with HQ	Assess Situation CG
76	29.66	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Assess Situation CG
83	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
84	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
84.75	48.58	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG hears D message via intercom
93	9.6	CG Scan	Scan (random2-5s) CG
94	48.96	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random2-5s) CG
95	136.69	Commo with HQ	Send voice message CG
		CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at his unit on map
98	163.33	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send voice message CG

Workload Profile for CG during Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
102.88	45	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at his unit on map
103	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
104	129.26	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	monitor + update C4 display
106.55	136.98	Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
112	13.5	Commo with HQ	Receive Digital Message CG
113.43	55.54	Commo with HQ	Receive Digital Message CG
		Crew commo in vehicle	CG talks via intercom
119	70.69	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send voice message CG
125	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
129	48.96	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
131.84	48.76	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG talks via intercom
132	119.29	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Voice Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
134	125.47	Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
137.15	11.3	Crew commo in vehicle	CG hears D message via intercom
142	9.6	CG Scan	Scan (random2-5s) CG
147.53	11.5	Crew commo in vehicle	CG talks via intercom
150	48.76	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
153	48.96	Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	Scan (random2-5s) CG
154	113.28	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	Scan (random2-5s) CG
157	52.32	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
161.44	52.72	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
163	245.82	Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	monitor + update C4 display
167.94	54.45	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Receive Voice Message CG
170	14.7	CG Scan	monitor + update C4 display
180.21	11.3	Crew commo in vehicle	CG hears D message via intercom
181	65.55	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Send voice message CG
182	125.69	Commo with HQ	Send voice message CG

Workload Profile for CG during Combat Scenario			
Time	Total Workload	Function Name	Task Name
		CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
194	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
199	48.96	Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	Scan (random2-5s) CG
200	143.87	Commo with HQ	Send voice message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG
201.88	235.77	Commo with HQ	Send voice message CG
		CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
209	14.7	CG Scan	monitor + update C4 display
213	14.7	CG Scan	monitor + update C4 display
217.68	11.3	Crew commo in vehicle	CG hears D message via intercom
222	9.6	CG Scan	Scan (random2-5s) CG
223	57.87	Commo with HQ	Send voice message CG
		CG Scan	Scan (random2-5s) CG
226	66.76	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send voice message CG
227.95	138.71	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG hears D message via intercom
232	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
236	52.32	Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG
246	13.5	Commo with HQ	Receive Voice Message CG
246.73	54.45	Commo with HQ	Receive Voice Message CG
		Crew commo in vehicle	CG hears D message via intercom
249	32.11	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG hears D message via intercom
251	72.54	Crew commo in vehicle	CG hears D message via intercom
		Commo with HQ	Assess Situation CG
		CG Scan	Scan (random2-5s) CG
260	69.62	CG Scan	monitor + update C4 display
		Commo with HQ	Receive Digital Message CG
261.12	143.32	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Digital Message CG
		CG Scan	monitor + update C4 display
265	33.53	Commo with HQ	Assess Situation CG
		Crew commo in vehicle	CG talks via intercom
269	9.6	CG Scan	Scan (random2-5s) CG
271	48.96	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
274.31	45	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
277	99.93	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
278	52.32	Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG

Workload Profile for CG during Combat Scenario			
Time	Total Workload	Function Name	Task Name
285.95	11.5	Crew commo in vehicle	CG talks via intercom
286	70.69	Commo with HQ	Send voice message CG
		Crew commo in vehicle	CG talks via intercom
290	42.09	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
301.88	11.3	Crew commo in vehicle	CG hears D message via intercom
302	45	Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG hears D message via intercom
304	66.76	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send voice message CG
307	163.33	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	monitor + update C4 display
		Commo with HQ	Send voice message CG
308	65.8	Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	monitor + update C4 display
309.73	136.98	Crew commo in vehicle	CG talks via intercom
		CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares other friendly to own location
317	9.6	CG Scan	Scan (random2-5s) CG
319.57	42.09	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
328	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
329.51	69.99	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Crew commo in vehicle	CG talks via intercom
330	48.76	Maintain awareness of enemy, own units	CG looks at his unit on map
		Crew commo in vehicle	CG talks via intercom
332	106.91	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
340	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
346	55	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG compares other friendly to own location
350.53	11.5	Crew commo in vehicle	CG talks via intercom
353	9.6	CG Scan	Scan (random2-5s) CG
362	9.6	CG Scan	Scan (random2-5s) CG
364	57.87	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Send voice message CG
365.98	134.05	Crew commo in vehicle	CG talks via intercom
		CG Scan	Scan (random2-5s) CG
		Commo with HQ	Send voice message CG
370	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
373	48.96	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
374.12	99.93	Maintain awareness of enemy, own units	CG looks at enemy location on map
		Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
380	13.2	Maintain awareness of enemy, own units	CG compares enemy location to own location
383	77.92	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		Maintain awareness of enemy, own units	CG compares enemy location to own location
386	153.82	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Receive Simultaneous Digital and Voice Messages

Workload Profile for CG during Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
		Maintain awareness of enemy, own units	CG compares enemy location to own location
389.63	38.67	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	Scan (random2-5s) CG
390	125.69	Commo with HQ	Send voice message CG
		CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG hears D message via intercom
395.97	11.3	Crew commo in vehicle	CG hears D message via intercom
396	54.08	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom
400	54.08	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
406	15.5	Commo with HQ	Send voice message CG
407	66.76	Maintain awareness of enemy, own units	CG looks at his unit on map
		Commo with HQ	Send voice message CG
409	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
416.67	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
421	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
423	66.38	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		CG Scan	Scan (random2-5s) CG
425	29.66	CG Scan	Scan (random2-5s) CG
		Commo with HQ	Assess Situation CG
429.02	11.3	Crew commo in vehicle	CG hears D message via intercom
439	11.8	Maintain awareness of enemy, own units	CG looks at enemy location on map
441	50.88	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
442	113.28	CG Scan	Scan (random2-5s) CG
		Maintain awareness of enemy, own units	CG looks at enemy location on map
		Commo with HQ	Send Digital Message CG
444	119.36	Commo with HQ	Send Digital Message CG
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG
452.1	11.5	Crew commo in vehicle	CG talks via intercom
457	45.65	Commo with HQ	Send Digital Message CG
		Crew commo in vehicle	CG talks via intercom
461	44.04	Commo with HQ	Send Digital Message CG
		CG Scan	Scan (random2-5s) CG
466	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
467.74	69.99	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
470	137.36	Commo with HQ	Receive Simultaneous Digital and Voice Messages
		CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
476	15.5	Commo with HQ	Send voice message CG
480	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
483	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
485.57	48.58	Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG compares other friendly to own location
487	129.26	Crew commo in vehicle	CG hears D message via intercom
		CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG compares other friendly to own location

Workload Profile for CG during Combat Scenario			
Time	**Total Workload**	**Function Name**	**Task Name**
493.3	11.5	Crew commo in vehicle	CG talks via intercom
496	54.93	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Receive Voice Message CG
508	14.7	CG Scan	monitor + update C4 display
509	85.97	CG Scan	monitor + update C4 display
		Commo with HQ	Receive Simultaneous Digital and Voice Messages
512	38.79	Commo with HQ	Assess Situation CG
		CG Scan	monitor + update C4 display
512.77	96.98	Commo with HQ	Assess Situation CG
		CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG talks via intercom
519	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
522	61.68	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	monitor + update C4 display
527	65.8	Maintain awareness of enemy, own units	CG compares other friendly to own location
		CG Scan	monitor + update C4 display
530	55	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Commo with HQ	Send Digital Message CG
533.37	45.65	Crew commo in vehicle	CG talks via intercom
		Commo with HQ	Send Digital Message CG
537	11.8	Maintain awareness of enemy, own units	CG looks at his unit on map
539	48.96	Maintain awareness of enemy, own units	CG looks at his unit on map
		CG Scan	Scan (random2-5s) CG
543	13.2	Maintain awareness of enemy, own units	CG compares other friendly to own location
545.07	48.58	Maintain awareness of enemy, own units	CG compares other friendly to own location
		Crew commo in vehicle	CG hears D message via intercom
550	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
559	9.6	CG Scan	Scan (random2-5s) CG
565.41	11.3	Crew commo in vehicle	CG hears D message via intercom
570	20	Commo with HQ	Receive Simultaneous Digital and Voice Messages
577	14.7	CG Scan	monitor + update C4 display
579	61.68	CG Scan	monitor + update C4 display
		Maintain awareness of enemy, own units	CG looks at enemy location on map
579.8	122.96	CG Scan	monitor + update C4 display
		Crew commo in vehicle	CG hears D message via intercom
		Maintain awareness of enemy, own units	CG looks at enemy location on map
585	48.96	Maintain awareness of enemy, own units	CG looks at enemy location on map
		CG Scan	Scan (random2-5s) CG
588	52.32	Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG
588.46	112.83	Maintain awareness of enemy, own units	CG compares enemy location to own location
		CG Scan	Scan (random2-5s) CG
		Crew commo in vehicle	CG talks via intercom
589	119.47	Crew commo in vehicle	CG talks via intercom
		Maintain awareness of enemy, own units	CG compares enemy location to own location
		Commo with HQ	Send Digital Message CG
594	9.6	CG Scan	Scan (random2-5s) CG
597	13.5	Commo with HQ	Receive Digital Message CG
600	7	Commo with HQ	Assess Situation CG

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